

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Fifth Semester B.Tech Degree Examination December 2021 (2019 scheme)

Course Code: CET305
Course Name: GEOTECHNICAL ENGINEERING - II

Max. Marks: 100

Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks)

		Marks
1	List the assumptions of Rankines Earth Pressure Theory.	3
2	Explain the situations where raft foundation is provided.	3
3	Explain the terms <ul style="list-style-type: none"> a) Net ultimate bearing capacity b) Safe bearing capacity c) Bearing capacity factors 	3
4	Differentiate general shear failure and local shear failure	3
5	How will you estimate the immediate settlement of foundation?	3
6	How are eccentrically loaded footings designed?	3
7	What is the basis on which the dynamic formula are derived? Write the equation of ultimate bearing capacity of pile foundation by Modified Hiley's Formula and explain the symbols involved.	3
8	Draw well foundation and mark its components.	3
9	Sketch a split spoon sampler and mark its parts.	3
10	For what purposes are geophysical methods used? Explain any one method	3

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

11	A retaining wall of 6m high, vertical back, supports a saturated clay soil with a horizontal surface. The properties of backfill are: $\phi=0$, $c=35\text{kN/m}^2$, $\gamma=17\text{kN/m}^3$ Assuming the back of wall to be smooth, determine: <ul style="list-style-type: none"> a) The depth of tension crack b) The critical depth of a vertical cut 	14
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- c) The active thrust against the wall and its point of application, if cracks are formed in the tension zone
- d) What will be the depth of tension crack, if any, if the backfill carries a uniform surcharge of 30kN/m^2 over the backfill surface? What will be the point of application of total active thrust?
- 12 Assuming the back of retaining wall to be smooth and vertical and the height of wall to be 6m. Calculate the magnitude and point of application of total passive thrust on the wall for the following case. 14
- Surface level, two layer backfill, water table is at 3m below GL.
- a) 0 to 3m $C=40\text{kN/m}^2$, $\phi=0$, $\gamma=17\text{kN/m}^3$, with a uniform surcharge of 50kN/m^2 over the soil surface.
- b) 3m to 6m $C=25\text{kN/m}^2$, $\phi=15^\circ$, $\gamma_{\text{sat}}=19\text{kN/m}^3$

Module -2

- 13 a) Explain Terzaghi's failure mechanism 6
- b) A column, carrying a load of 750kN, has to be supported by a square footing with its base at 1.5m depth. What is the required size of footing which will provide a factor of safety of 3 against shear failure? $C=10\text{kN/m}^2$, $\phi=30^\circ$, $\gamma=17\text{kN/m}^3$. Water table is at greater depth. Assume General Shear Failure. For $\phi=30^\circ$, $N_c=37.2$, $N_q=22.5$, $N_\gamma=19.7$. 8
- 14 a) A strip footing 1.5m wide, with its base at a depth of 1m, resting on saturated soil with $C=30\text{kN/m}^2$, $\gamma=17\text{kN/m}^3$, $\phi=30^\circ$. For $\phi=30^\circ$, $N_c=37.2$, $N_q=22.5$, $N_\gamma=19.7$. Determine the net ultimate bearing capacity of footing if the ground water table is 9
- a) 0.5m below the ground surface
- b) 0.5m below the base of footing
- b) Explain Skempton's Bearing Capacity Analysis for Clay soils. 5

Module -3

- 15 a) Explain and illustrate the procedure, uses and limitations of plate load test. 10
- b) What are floating foundations? 4
- 16 a) Explain the conventional method for the design of raft foundation 6
- b) A trapezoidal footing is to be produced to support two square columns of 30cm and 50cm sides respectively. Columns are 6m apart and safe bearing capacity of the soil is 400kN/m^2 . The bigger column carries 5000kN and smaller 8

3000kN. Design a suitable size of the footing so that it does not extend beyond the face of the columns.

Module -4

- 17 a) How will you determine safe load capacity of single pile in sand by static method? 6
- b) A group of 9 piles arranged in a square pattern with diameter and length of each pile as 25cm and 10m respectively, is used as a foundation in soft clay deposit. Taking the unconfined compressive strength of clay as 120kN/m^2 and pile spacing 100cm c/c, find the safe load capacity of pile group. Assume factor of safety 3 and adhesion factor 0.9. 8
- 18 a) A square pile group of 16 piles penetrates through a filled up soil of 3m depth. The pile diameter is 250mm and pile c/c spacing is 0.75m. The unit cohesion of material is 18kN/m^2 and unit weight of soil is 15kN/m^3 . Compute the negative skin friction on the group. Assume adhesion factor =1 8
- b) Explain any 6 methods to rectify tilt of well foundation with neat sketches. 6

Module -5

- 19 a) Explain the IS guidelines for choosing depth and number of boreholes. 7
- b) The inside diameters of a sampling tube and that of a cutting edge are 70mm and 68mm respectively and outer diameters are 72mm and 74mm respectively. Determine the inside clearance, outside clearance and area ratio of the sampler. 7
- 20 a) Describe with the help of a neat sketch how will you carry out wash boring method of soil exploration. What are its merits and demerits? 7
- b) Describe the Standard Penetration Test used in soil exploration. When will the boring log shows refusal and the test is halted. What are the corrections recommended by IS: 2131-1981 for the field value of N. 7
